UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8, MONTANA OFFICE
FEDERAL BUILDING, 10 West 15TH Street, Suite 3200
Helena, MT 59626-0096
Phone 866-457-2690
www.epa.gov/region80

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Ref: *8MO*

MEMORANDUM

SUBJECT: Mine Site Category Determination for Fiscal Year 2017 Planned Activities, Barker-Hughesville NPL Site, Block P Mining Complex, Judith Basin and Cascade Counties, Montana

FROM: Roger Hoogerheide, Remedial Project Manager

THRU: Joe Vranka, Unit Chief

TO: The Barker-Hughesville Project Site File

This memorandum is written to the file as documentation of the Mine Site Category determination required by the EPA Headquarters' memorandum (James Woolford/Reggie Cheatham, 4 April 2017).

Site History

The Block P Mine Complex (the Site) is located within Judith Basin County approximately 55 miles southeast of Great Falls, Montana. The Site is located approximately 1.5 miles north of the Block P Mill Tailings Site within the Galena Creek watershed. Mining activities in the project area date back to 1879, when the first discovery of silver and lead ores was made. Near-surface ores were depleted by 1883. Mining activities in the area fluctuated between boom and bust cycles for the rest of the 19th century and for the first two decades of the 20th century due to unreliable transportation networks and fluctuating commodity prices. In 1927, the Block P properties were purchased by the St. Joseph Lead Company (whose successor is Doe Run Resources). The onset of the Great Depression forced the mine to close operations in 1930. The mine was briefly operated from 1941 to 1943, but closed once again at the order of the War Production Board. Minimal mining and exploration has occurred since the 1940s.

Physical Setting

The Site is located on patented mining claims within the Helena-Lewis and Clark National Forest, and elevations range from approximately 5,500 ft. to more than 6,000 ft. above mean sea level (AMSL). Galena Creek is the major stream that traverses the mineralized ore body and originates upstream of the project area and flows from north to south through the Site. In general, the mining features attributable

Commented [HJ1]: If you use AMSL here, it will correspond to the 1945 Block P Mine cross section that AMFW discussed during the pre-scoping conference call.

to the Block P Mine Complex are located west of Galena Creek. In addition, there are numerous other historical mining properties and features present within the Galena Creek watershed. These other mining properties and features have been the focus of recent investigations by EPA.

The Site used to contain several discrete waste rock piles and their associated mine workings that were addressed as part of a responsible party lead removal action conducted by Doe Run Resources between 2011 and 2013. Prior to the removal action, the Block P Mine consisted of a large waste rock pile containing about 200,000 cubic yards, mining-era buildings, and an uncontrolled mine adit at the 75 foot level (5910 feet elevation AMSL) that discharged to Galena Creek. The discharge coming from the Block P Mine flows year round with seasonal fluctuations in flows.

The Grey Eagle Mine is located on the east side of Galena Creek, across the valley from the 75 foot level. Depending on factors such as the time of year and overall precipitation patterns in the watershed, acid mine drainage from the Grey Eagle mine either discharges to Galena Creek via a constructed ditch or infiltrates into the ground at the mouth of the adit before reaching the creek.

In May 2011, the EPA issued Doe Run Resources an Administrative Order on Consent, requiring the implementation of a removal action at the Block P Mining Complex consistent with the Action Memorandum. Removal actions included excavation of mine wastes and consolidation of those materials into a repository located on property acquired by Doe Run. Under EPA and Montana DEQ oversight, an estimated 305,600 cubic yards of waste rock was excavated from the individual mines in the Block P Complex. The Galena Creek channel was also reconstructed and new culverts were installed at the up- and down-stream ends to facilitate passage of future flood flows and aquatic species. The culvert at the upper end of the corridor and the channel immediately downstream of this new culvert were aligned to carry flow slightly to the west of where the original channel was located to reduce the possibility that future high flow events would contact potentially-impacted soils that extend outside the project area. The resulting actions resulted in the draining of the underground workings from the 75 foot level to creek level in 2012. Historic underground working maps and a geophysical survey conducted in 2016 indicate the presence of underground workings at the toe of the former waste rock pile and underneath Galena Creek. Given the proximity of these workings to the surface, three uncontrolled seeps discharge directly into Galena Creek. The overall conclusion from this paragraph is that current equilibrium water table elevation in Block P Mine complex is 5910 feet AMSL which results in < 75 gallons per minute discharge into Galena Creek at high flow and < 50 gpm during base flow conditions. Therefore, the Block P Mine Complex is a Category 2 probable fluid hazard Site, as determined using Table 1 in Attachment 1 of the applicable memo cited above.

Commented [HJ2]: You may want to describe this the way the 1945 Block P mine cross section does; i.e. 75-Level. It will be understood that the units are in feet and this will also conform to 19th century mining terminology that is still understood today.

Commented [HJ3]: Show the actual topographic elevation of this mine adit level to improve the general understanding of the current fluid level residing in the mining complex.

Commented [HJ4]: If you have sufficient data for your CSM, can you describe the range of measured or estimated flows draining from the 75-level into Galena Creek?

Commented [HJ5]: Comment as above for consistent terminology.

Commented [HJ6]: Consistent Terminology

Commented [HJ7]: I need help here in my understanding of the situation. The 1945 Block P Mine cross section you provided at the conference seems to indicate that Galena Creek level IS approximately 5910 feet elevation or only slightly lower than the 75-Level floor elevation. Is my understanding correct?

Commented [HJ8]: Is the surface expression of these seeps above or below the 75-Level? Does your level of confidence in the CSM allow you to conclude that the source of these seeps is the equilibrium surface of the water table stored in the Mine Complex? If so, this will help you conclude that a seep interception grouting program will not disturb the equilibrium water level and result in new discharges in other uncontrolled locations.

Planned Activities in 2017

The planned site activities for 2017 at the Block P Mining Complex are intended to reduce uncontrolled releases to Galena Creek and include the following:

1. Measure flows from each of the seeps adjacent to the stream at the Site.

2. Temporarily put Galena Creek in a pipe starting at the culvert crossing the road upstream of the Site and extending approximately 500 ft. downstream.
3. Build an earthen access road on the west side of the stream starting at the culvert and extending downstream approximately 200 ft.
4. Observe and measure flow from each of the three seeps at and near the Site for a 2-week period
5. Grout the 3 seeps with concrete, bentonite or a polyurethane resin such as Avanti AV-202-LV and Oakum as manufactured by Avanti International or equivalent from the surface of each seep.
6. Monitor grouting from surface for a period of two weeks and if not successful, pressure grout seep areas and monitor again
7. Construct a new stream channel east of existing channel.
8. Haul and add fill to the toe of the slope, approximately 5000 CY from nearby borrow source. This soil may be amended with bentonite to reduce its permeability
9. Topsoil and reseed new slope toe
10. Stabilize the Gray Eagle and 75 level Block P Portals by installing new timbers and putting new locking gates on each portal.

The primary objective of the above activities is to strengthen the slope toe adjacent to the Block P underground working near the surface so that stream erosion cannot compromise the stability of the workings. Secondary objectives are to reduce the volume of water seeping from existing workings, and prevent oxidation of any minor discharges to Galena Creek that were exposed due to the removal action. Prior to removal action, there was mine waste covering the toe of the slope and stability was less of a concern. In addition, the waste rock that previously covered the slope toe caused mine impacted water to discharge from the 75 foot adit and not from seeps adjacent to the stream. If this condition can be recreated, the adit discharge may be addressed in the construction season of 2018, including potentially installing a bulkhead in the adits. In addition to moving the stream away from the near surface mine workings, re-timbering the adits and installing new locking gates will make the area safer from potential trespass. These gates will not cause any hydraulic changes and have little potential to change the fluid hazard represented by the static water level just below the 75 foot level tunnel. Therefore, the Block P Mine activities that will occur in 2017 would be considered a Sub-Category "N" (Non-Hazardous) where the EPA Region 8 Montana Office will oversee activities that are not likely to increase the fluid hazard as described in Table 1. However, any bulkheading of the Grey Eagle and Block P Mine that is contemplated in 2018 will require additional consultation with OLEM prior to commencement of work.

Due to the "2N" sub-category determination for this phase of Block P Mine work, consultation with OLEM is not required prior to initiating the planned activities for 2017.

Commented [HJ9]: Step 5 could be improved with AFW's help to describe the goals of this grouting program. Without getting into technical detail, Step 5 should describe the concept of sealing the seep flowpath with the most effective grout material at a pump pressure low enough to avoid creating additional fracture flowpaths. The types of potential grouting materials, i.e. cement, bentonite slurry, or polyurethane resins is probably not that important for this memo.

Commented [HJ10]: The important point in Step 6 is that this will be a monitored grouting operation with sufficient technical oversight and control of pump pressures and grout material placement to avoid unintended consequences. The grouting operation can be curtailed if its effects on the seeps are not desired and make the releases worse.

Commented [HJ11]: Can AFW show you their geotechnical stability analysis of how this 5000 cy surcharge or additional overburden weight on the toe of the slope will reduce the seepage and redirect the water in a more desirable direction? The answer to this question, if available, is not necessary for this memo.

Commented [HJ12]: Consistent terminology

Table 1. Mine Conditions/Field Activity Category Matrix-Region 8

	Category N (No EPA actions that would increase fluid hazard)	**Category H** (Fluid Hazard)
Category 1 Sites with no known water in the mine, or sites containing fluids with no or low fluid hazard	Gilt Edge, Milltown Reservoir Sediments, ACM Smelter and Refinery, Anaconda Aluminum Columbia Falls, Anaconda Smelter, East Helena, Libby, Mouat Industries	
Category 2 Fluids exist but fluid hazard is not sufficiently characterized or is unknown	California Gulch, Captain Jack, Central City, Eagle, Standard, Summitville, **Barker-Hughesville**, Basin, Carpenter-Snow Creek, Silver Bow Creek /Butte, Upper Tenmile	Nelson Tunnel
Category 3 Sites that have a known or probable fluid hazard		Bonita Peak, Flat Creek IMM